

DOCUMENT RESUME

ED 335 899

FL 019 365

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TITLE Geolinguistic Representation. Discussion Papers in
Geolinguistics, No. 15.
INSTITUTION Staffordshire Polytechnic, Stoke-on-Trent (England).
Dept. of Geography and Recreation Studies.
REPORT NO ISSN-0262-9291
PUB DATE 89
NOTE 31p.
PUB TYPE Information Analyses (070)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cartography; Foreign Countries; Geography;
Illustrations
IDENTIFIERS *Geolinguistics; *Language Maps

ABSTRACT

One of the most characteristic features of geolinguistic study is the recourse to maps and diagrams; authors often supplement words with illustrations of patterns and processes stemming from the spoken word. This transposition of word and image is significant, for maps and diagrams are a sign of language. The concerns of the linguistic map maker can be seen to mirror the more general debate about methods in the social sciences, and particularly those in the developing discipline of geolinguistics. It is contended that practioners of geolinguistics have not clearly recognized the role and value of illustration, nor have they been able to exploit it to the full. The same can be said of illustrations as of words: used without a full understanding of their meaning, they can confuse rather than clarify the message. Accumulating evidence suggests that maps can make useful servants in linguistic study, but that they are not without the potential to disappoint and even deceive their users and makers. As with all other means of imparting information, linguistic cartography depends on good quality data. (JL)

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GEOLINGUISTIC REPRESENTATION

John Ambrose
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Colin H. Williams

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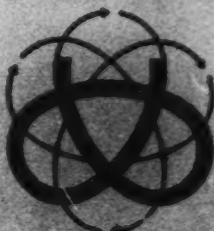
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DISCUSSION PAPERS IN GEOLINGUISTICS

No. 15

Department of Geography and Recreation Studies
Staffordshire Polytechnic



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Geolinguistic Representation

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DISCUSSION PAPERS IN GEOLINGUISTICS, 15
STAFFORDSHIRE POLYTECHNIC, 1989

ISSN 0262 - 9291

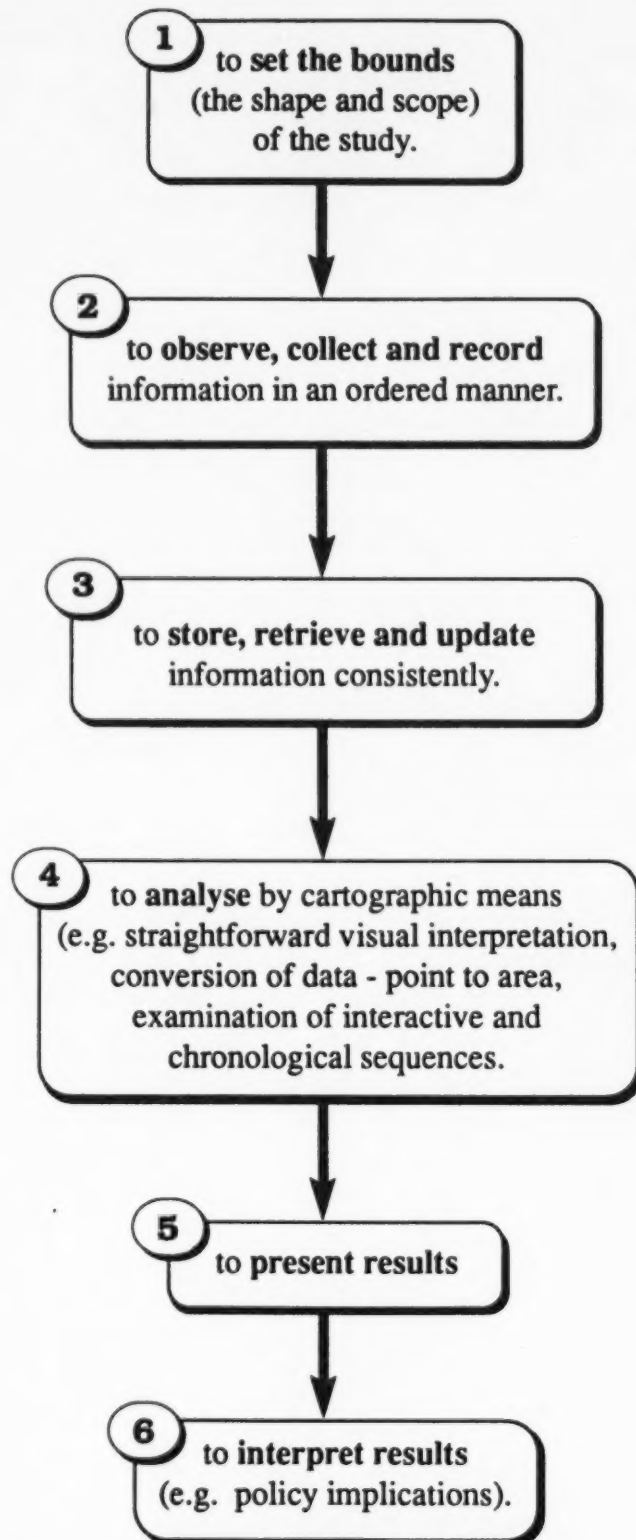
One of the most characteristic features of geolinguistic study is the recourse to maps and diagrams; authors often supplement words with illustrations of patterns and processes stemming from the spoken word. This transposition of word and image is significant, for maps and diagrams, too, are a form of language. The concerns of the linguistic map-maker can be seen to mirror the more general debate about methods in the social sciences, and particularly those in the developing discipline of geolinguistics, but it will be contended that practitioners of geolinguistics have not, as yet, clearly recognised the complete role and value of illustration, nor have they been able to exploit it to the full. The same can be said of illustrations as of words: used without a full understanding of their meaning, they can confuse rather than clarify the message. The Tower of Babel has its illustrative equivalent!

If it is indeed the case that illustration is such a central support of geolinguistics, it is all the more important that its potential and limitations are understood. Macaulay, in a recent article entitled *Linguistic Maps: visual aid or abstract art?*, stresses what he perceives to be limitations. He thanks the map-makers for "the elegant works of art that grace my coffee-table and intrigue my visitors". At the same time, he produces, from the areas of phonology and dialect-mapping, a series of illustrations which serve to show how most language maps stop short of the levels of analysis and interpretation which should be expected of them if they are to

be seen as making an undisputed contribution to the study of linguistics (Macaulay, 1985). As data-gathering exercises, the *Atlas of English Sounds* (Kolb, 1979) or the *Linguistic Atlas of Scotland* (Mather and Speitel, 1975-7) can hardly fail to impress; but their makers, Macaulay implies, clearly see their brief to be that of the laying out of descriptive information for the use of others, rather than the task of providing interpretation. Cartographers then express disappointment when their maps are ignored or under-used by the wider academic community (*op.cit.*, p.172).

Most of what follows will relate specifically to maps and their uses, rather than to diagrams more generally. This is because criticisms such as those quoted are directed particularly towards language maps, their makers and perhaps also their users. While such critical comment must be taken seriously, it may stem, in part, from a misapprehension that the process of map making is a descriptive rather than an analytical one - that it fails to reflect, in its procedures, the full range of activity of the social sciences. The range of functions which map making can fulfil is ambitiously large, as Figure 1 contends, and covers everything from the initial data collection to its analysis, in space and over time, and the presentation and interpretation of results. It must be admitted that it would take a very unusual map indeed to accomplish all of these at the same time, but we would contend

The Function of Maps in Geolinguistics



that each stage is perfectly capable of being achieved by cartographic means.

The reality of the cartographic contribution to geolinguistics does not always match these ideals. It is not that language maps are a rarity, nor even that existing maps are unsatisfactory - just that they tend not to fulfil the complete range of the functions on Figure 1. Readers opening nearly any recent book on dialectology, for example, will discover, first, a heavy dependence upon map support, but those maps will be almost certain to be examples of either stage 2 or stage 5 on Figure 1. Only rarely will they serve a directly analytical purpose. Secondly, the great majority will represent static patterns (such as locations), using punctiform, linear or areal symbols, and will not convey the interactive and dynamic character of language use.

It is not that the art and science of linguistic mapping is not developing; a number of workers have given it a great deal of attention. One of the most tireless is R. Breton. Scarcely a continent seems to have escaped his attention since the mid-1970s, and his forays into the portrayal of language patterns in economically "less-developed" areas are a particularly valued addition to the literature (Breton, 1989). One of the more significant aspects of his work is his willingness to encompass a range of scales, adjusting his technique to suit world patterns or the large-scale depiction of areas of a few

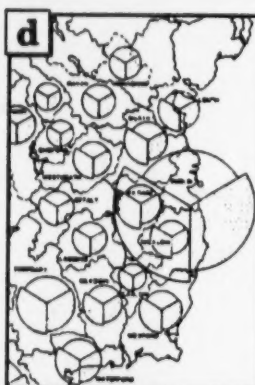
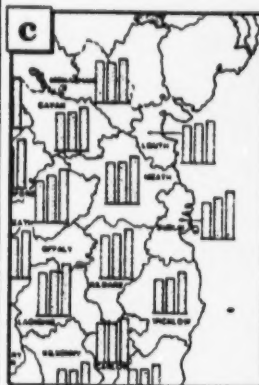
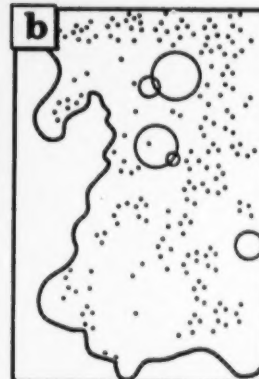
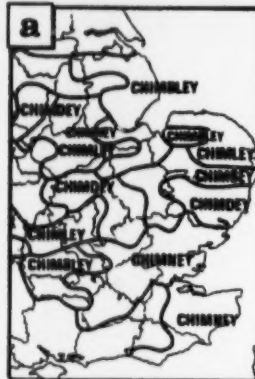
hundreds of square kilometres. Breton is unusual in having given innovative thought to ways of depicting language dynamics (such as diffusion). It is interesting, though, that when he does so, he almost always replaces maps with diagrams, at a smaller, more general scale and of more abstract form than his static language maps.

It would be misleading, however, to come to the conclusion that maps are more suited to static, descriptive, geolinguistic patterns and diagrams to dynamic and analytical ones. Such is the variety of mapping techniques, in fact, that it is difficult to generalise about them at all. From the vast array of cartographic methods found in a selection of published material, the examples in Figure 2 are presented, to reinforce this impression of variety. We have adopted, as a brief means of classification, two conventions common in cartography: a typology of "point, line and area symbols" and a differentiation between methods which are "qualitative" or "quantitative" in approach. Amongst the many other efforts to classify linguistic maps one of the more notable is perhaps that of Chambers and Trudgill (1980), quoted by Macaulay, who distinguish between "display maps" and "interpretative maps". The latter term is a reminder that to draw a language map can involve an element of analysis. Sometimes the results can be surprising, to the map maker as well as to the subsequent user. Personal experience, for example, includes the drawing of maps of two separate sets of information in the Welsh

A Selection of Commonly-Used Language Mapping Techniques

The traditional repertoire of "point, line and area symbols" lends itself well to most basic language mapping tasks.

Sometimes, as in (a), it is more appropriate to employ the written word.



POINT SYMBOLS

(b) Dot-map and proportional circles.
Quantified point symbols:

(c) Bar graph and
(d) Divided proportional circle methods.

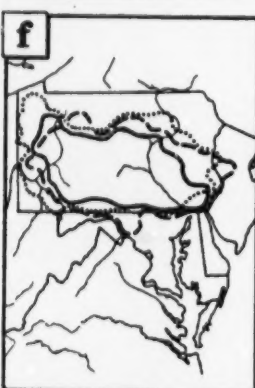
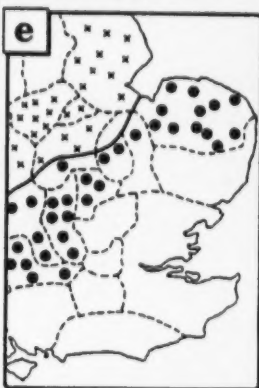
LINE SYMBOLS

(e) Boundary line.

(f) "Bunches" of
isoglosses in linguistic
transition zones.

(g) Quantified line
symbols: isolines
indicating a continuous
language surface.

(h) Lines indicating
language dynamics
on a diffusion map.



AREA SYMBOLS

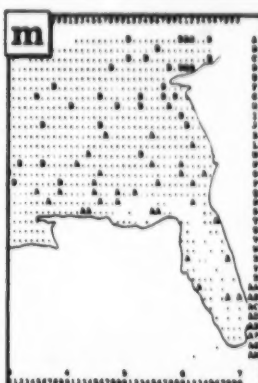
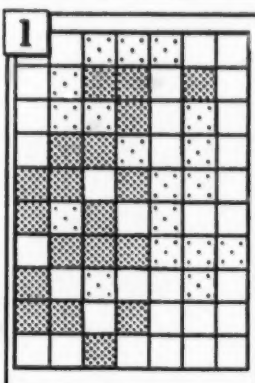
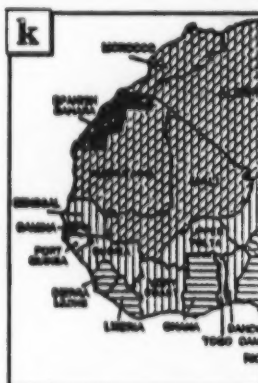
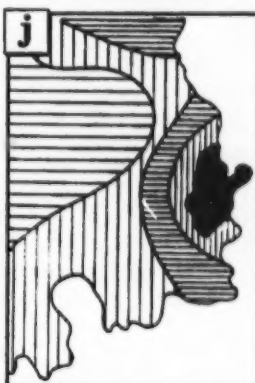
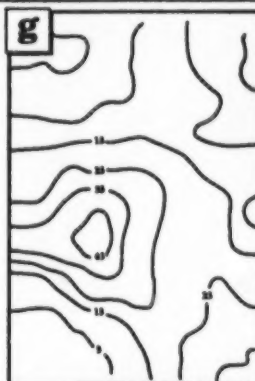
(i) generalised, large-scale chorochromatic map.

(j) quantified choropleth map.

(k) chorochromatic shadings based on political units.

(l) choropleth shadings based on a grid.

(m) computer-generated language map.



Sources:

adaptations from original sources

(a) Upton et al. (1987).

(c) and (d) Williams (1988).

(e) Trudgill (1983).

(f) Kurath (1949).

(h) and (k) Alexandre (1967).

(i) Kariel (1972).

(j) Chambers and Trudgill (1980).

(l) Ambrose (1988).

(m) Kretschmar (in A. R. Thomas, 1988).

Borderland: first, of the percentage of people able to speak Welsh; then of their patterns of Welsh use in practice. The methodology in that case amounted to little more than the careful visual comparison of the two maps, but it revealed that language-planning approaches based only on evidence of percentages of speakers would be a quite inappropriate strategy, at least in that locality (Ambrose, 1979). Crude though the process might have been, it helped lead the way towards a realisation that the existing basis of spatial language planning in Wales was deficient, and to that extent, at least, it fulfilled an analytical function.

Returning to Macaulay's criticisms, it could be asked, with some justification, why language mapping, if it indeed possesses an analytical potential, so often restricts itself to its descriptive role. Two sets of reasons suggest themselves, the first stemming from the broad relationship between geography and linguistics and the second inherent in the mapping process itself.

At a general level, there is the whole question of the compatibility of linguistics and geography, whose relationship rather rarely seems like a true "meeting of minds". Perhaps one of the roots of the problem is that those who possess expertise in techniques such as phonetic transcription cannot necessarily be expected to have the same level of experience of the rudiments of map construction, whilst those well-

trained in cartography are similarly poorly-versed in basic linguistic and phonetic methods. Linguists venture into the world of map making and geographers into the realms of linguistics, but rarely is there genuine co-operation in the setting-up of goals and methods. The problems of the linguists are compounded by the fact that, as Figure 2 illustrated, the choice of potential cartographic methods is so wide that few conventions for language mapping have yet been established. Individuals such as Breton, working in a genuine spirit of experiment and against a background of cartographic styles which are often culturally or nationally distinctive, are obliged to employ mapping techniques without recourse to clear standards of comparability. The International Phonetic Alphabet is not yet matched in the field of cartography.

More specifically, it could also be that the process of constructing language maps has included a number of constraints which have devalued their contribution to linguistic study. Not the least of these is that map makers face an ever-present problem of resources, in terms of money and labour. There is no doubt that acquiring language data is time-consuming, and to turn them into maps often requires a much more voluminous sample than has been the norm in linguistics. The increasing of the sample size usually means, in turn, the simplification of the data, to the dismay of linguists. Often, only the most basic and general information (for example, numbers of speakers of a language) reaches the

stage of mapping. On most occasions the degree of compromise is far greater than so far implied, and the makers of maps are obliged to rely on ready-gathered statistics, collected for administrative purposes but adapted, as far as possible, to academic ends. As an example of this, cartographic users of the language Census data for Scottish Gaelic and Welsh are long used to the restricted range of evidence at their disposal. The Census usefully documents several of the quantitative aspects of the ability to speak these languages, but almost wholly neglects the more qualitative assessment of their state of survival (for example, the domain-related frequency of their use). Elsewhere, better progress has been made - not least in Canada, with the use of a sophisticated Census linguistic data source. The process of map making, as outlined on Figure 1, is an active and potentially influential one. At best, it can be a vital ingredient in the framing of language policy (as, for example, in the case of the drawing-up of Canada's bilingual districts (Cartwright, 1971)).

The accumulating evidence is that maps can make useful servants in linguistic study, but that they are not without the potential to disappoint and even to deceive their users, not to mention their makers. Stages 1 and 6, on Figure 1, perhaps best illustrate that observation. Stage 1 (the selection of the precise area to be mapped, together with the units which comprise it) is a task frequently given less consideration than it deserves. Existing administrative areas,

such as counties, with their internal divisions into civil parishes or similarly-sized components, are the usual, pragmatic compromise in Wales and Scotland, regardless of the fact that their boundaries may be irregularly-shaped, largely arbitrary and subject to variation over time. Yet, by stage 6, such units may have become transformed, by some miraculous process, into districts for the administration of language policy. The formulation of spatial language policy reveals itself as a highly pragmatic process: "culture regions", "zones of linguistic collapse", "bilingual districts" and a host of other areal designations originate partly in a quasi-random process in which people can become net beneficiaries or losers, depending upon chance factors of location and the meanderings of boundaries.

If boundaries are deceptive, so too are scales. The question of scale, fundamental to most geographical study, furnishes at least part of the explanation for such patchy progress in the drawing of analytical language maps. It is necessary, in most conventional forms of map making, to group together information into areal units - a problem in that linguistic processes operate, for the most part, at the level of the individual speaker. It is a source of ceaseless frustration to map makers that official language data-sources provide information in aggregate form (for quite understandable motives of confidentiality, it must be admitted) using units ranging from randomly-aggregated grid-squares to postal

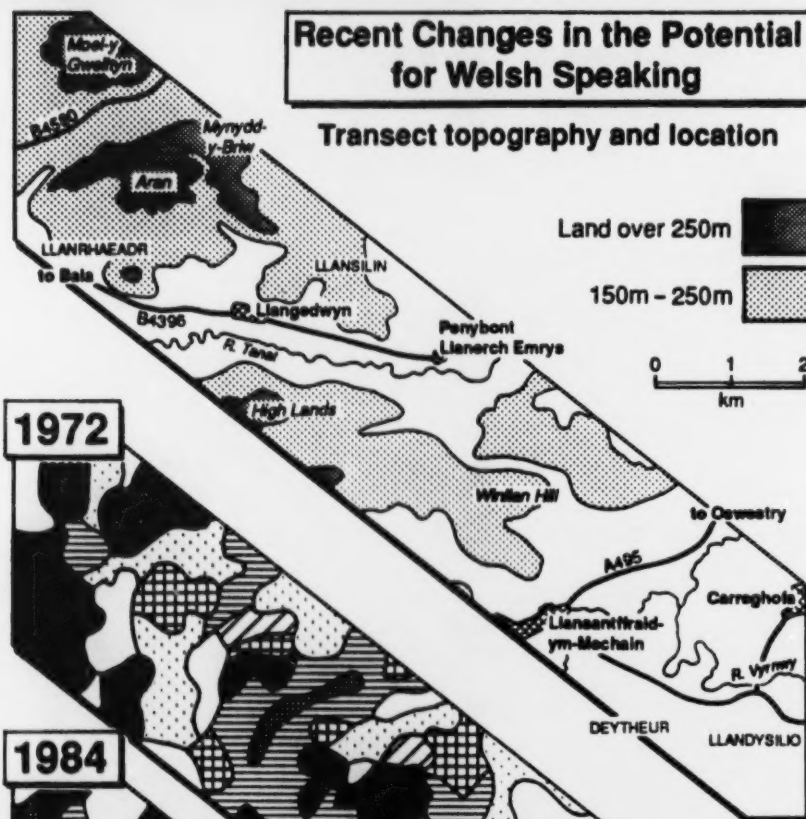
districts, but quite incompatible with the needs of analytical cartography. This incompatibility of scale is another of the contributory factors which could be seen as casting cartographers in the role of secondary observers of linguistic processes, rather than agents of their understanding.

A case drawn from the Welsh language area can illustrate this scale problem. Welsh is one of Europe's best-documented minority languages. A sequence of census information, since the end of the nineteenth century, forms the basis of numerous national and regional maps of its regional strengths and weaknesses, and is supplemented, in turn, by numerous studies of the language's role in education, cultural and political life (Betts, 1976; Pryce and Williams, 1988). In many respects, details of Welsh are not lacking; yet the emergence of a co-ordinated set of regional and local policies for the Welsh language has been slow. One of the contributory factors, it can be argued, is a gap in the understanding of the local, areal processes operating to affect the language. Some of the missing evidence merely calls for a different scale of map compilation, analysis and presentation.

Figure 3 represents one such alternative. It takes a section of countryside in the central Welsh Borderland (see top map) and illustrates Welsh-speaking ability (by households) at two dates, a dozen years apart. The section covers a range of topography and incorporates parts of some four or five civil

Recent Changes in the Potential for Welsh Speaking

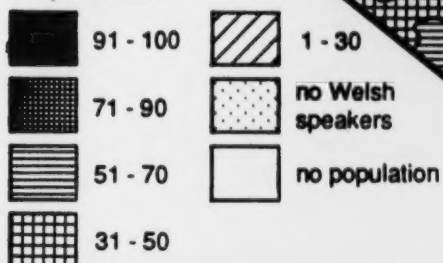
Transect topography and location



1972

1984

Percentage of households with one or more members able to speak Welsh



Welsh-speaking potential in 1972 & 1984

parishes. The parish scale is not especially important, however: the processes occurring over the period are clearly operating at a much more local level. Language planners would need to be aware of the changing fortunes of the farming industry, of house prices, journeys to work and the availability of schools and social services, if any clear picture of the fortunes of Welsh were to be achieved. No-one could pretend that the data are conceptually-sophisticated - only that they are mapped at a scale commensurate with the highly-complex changes taking place in this area.

The short time period between the two dates on Figure 3 reveals the degree of social upheaval, and associated linguistic change, now taking place in this locality, and also provides some more general lessons in methodology. In cases where we have to compromise on detail, one measure in particular can be taken to increase the value of linguistic mapping; that is, to create a "time series" - a sequence of data sets for the same place. Figure 3 clearly demonstrates the need for such a quickly-generated sequence: decisive patterns of change can take place within short time periods. If that is a general feature, then elaborate policies directed solely at language can become out-dated even before they have time to be implemented. Such policies must be tailored clearly to the needs of the locality, and be part of an overall strategy for local development; and they cannot simply be imposed "from the top downwards" - by deriving a national-

regional language policy and applying it locally - if they are to have any realistic chance of success. An element of successful language planning is the ability to anticipate the changes which are likely to occur in any particular area. In the past, Welsh language census data, mapped at the national scale, have enabled a relatively accurate process of linguistic "sophology" to be undertaken, in order to predict which areas are next likely to experience severe pressures of anglicisation (Williams, 1980, 1989). The main obstacle to repeating that exercise at the scale of the locality, though it is inherently a rather more complex exercise, is the rarity of sufficiently-detailed time series such as that on Figure 3. The question is, could there be any prospect of such developments?

If the situation in such relatively simple cases as bicultural Wales is lamentable, it is even more deplorable that we tend not to possess the linguistic evidence to make accurate judgements about areas of the world where more rapid, complex and potentially more disruptive linguistic changes are under way (as, for example, in such multicultural cities as Manila, Jerusalem or Kuala Lumpur). Major cities are often the context for competing language groups in their struggle for survival and recognition, for access to services, for education or for the legalization of their language in the workplace, in commerce and in industry. The ecology of language shift has been ably demonstrated in a number of Western cities such as

Toronto, Philadelphia, Amsterdam and Montreal, but we have little by the way of sustained, comparative research into the structure of multilingual cities world-wide. Even the most basic mapped data concerning the total numbers and distribution of language groups is absent, let alone the more geolinguistically-sensitive concerns as to when and where language switching or language loss takes place within urban areas. This need for accurate, consistent and finely-tuned language maps will become even more pressing as societies witness more inter-urban and international migration, and as the principles of cultural pluralism are increasingly employed to counter assimilationist tendencies. For the truth remains that languages in contact are often languages in conflict, especially when linguistic divisions are closely correlated with other socio-cultural differences, such as religion, lifestyle and political affiliation.

The picture of linguistic mapping which we have presented is one which has emphasised the frequent shortcomings of the medium, as well as stressing its undoubted potential uses. Of the many functions which maps can fulfil, the analytical ones, in particular, are under-represented. Language mapping still appears to be at an exploratory stage, with few conventions (particularly to aid cross-cultural comparison) yet established. Resource shortages, expressed in time, money and expertise, have meant slow progress, and individual inventiveness has not been matched, in many cases, by official

and government mapping agencies. In particular, this has involved a failure to to derive systems with a sufficient flexibility of scale to encompass local and more general processes, and insufficient recognition of the importance of constantly monitoring linguistic change. In general, it would not be unfair to say that most language mapping has traded quantity for quality, as well as simplifying much evidence to the point where it becomes difficult to perceive the processes taking place. No wonder that linguists often fail to recognise the potential of drawing language maps. A classic example of this inevitable compromise between ambitious ideals and more mundane results was recently provided in the production of the map of the lesser-used languages of the European Community, which forms our final case study.

In 1987 the European Bureau for Lesser-Used Languages (E.B.L.U.L.) commissioned a map of such languages in the European Community. Preparation of an E.C. language map to complement those already produced for political administrative units, population, agriculture and other themes was a daunting and complex task, for whilst information is generally available on the size and distribution of the nine official Community languages, together with other State languages, such as Irish, the equivalent data for lesser-used languages are lacking. Yet at least one in every six citizens of the E.C. speaks a lesser-used language. It has been estimated that of

the Community's 321 million inhabitants, some 50 millions speak a lesser-used language (O'Riagain, 1989).

The first problem, as in Figure 1, was one of definition. What are the appropriate geographical units, and what constitutes a lesser-used language? Is Scots in the United Kingdom, or Polish in the Federal Republic of Germany, a legitimate use of the term, in comparison, say, with Breton in France, or Sard in Italy? Is Galician, which linguistics would accept as being Portuguese, to be considered a lesser-used language, merely because it happens to be the version of Portuguese spoken in North West Spain? Again there is the classic problem, in linguistics, of differentiating between a dialect and a language: for example, should Valencian be considered as an autochthonous language, or as a variant of Catalan? For that matter, can one justify the designation of Catalan, spoken by over eight million people, as a lesser-used language?

The answers to these questions were largely determined by political, rather than purely linguistic, considerations. As the E.B.L.U.L. is comprised of representative committees from the member states of the E.C., it is their definitions of what they consider to be lesser-used languages within their state, which count, not the criteria as defined by professional linguists. Thus, for example, though Letzburgish is the national language of Luxembourg, it is also a lesser-used

language there, for it is overshadowed by French, German and English as working languages.

As with all other means of imparting information, linguistic cartography depends upon good quality data. Unfortunately there is great variation in the usefulness of data, whose quality declines progressively, in general terms, from north to south and from west to east across the territory of the Community. Thus whilst both Scotland and Wales have a century-long tradition of asking language questions in their decennial census (Pryce and Williams, 1988), Euskadi, Catalonia and Brittany have only recent and very modest sociolinguistic surveys of language affiliation available, though in the Catalan and Basque cases it is fair to say that the Autonomist governments are doing their best to provide an historical overview of the changes in the fortunes of Catalan and Euskera, and have established a comprehensive census data base on knowledge of speaking, reading and writing these languages. However, for many of the lesser-used language communities, such as Vlak, Macedonian and Turkish in Greece, or the Langues d'Oc in France (Sérant, 1965), much of the current information available in the literature is based on a combination of guess-work, inspired scholarship and partisan estimates. Inevitably, then, we are faced with a choice of either displaying detailed language distributions for north and west Europe, leaving southern and south-eastern Europe relatively sparsely-covered, or of reducing the overall level of

representation to the lowest common denominator for the whole of the map.

This is not a new problem in cartography. The relationship between representation and reality is one of the most intractable and complex problems, common to many forms of expression, whether it be in fine art, sculpture, music or image-creation in map form. J.S. Keates (1982) surveys the myriad forms by which cartographic signs and symbols may be used to generalise and simplify a multi-dimensional reality in two-dimensional space. He cites Petchenik's (1975) observation that most people acknowledge that a single 'map' (in the same way as a single picture) "can 'tell' more than hundreds of words, yet our vocabulary is deficient in trying to state what the map 'tells'" (p.86). We need more sensitive interpretations of the sign language of maps, for despite the enormous developments in psycho-linguistics as it pertains to thought and language, our visual representation of reality is still hindered by our impoverished language of 'explanation'.

Modes of signifying cognitive and non-cognitive (or referential and expressive) items are also subject to the use of general or classificatory concepts, such as colour choice or symbolic representation. To cite an example, conventional cartographic practice in Europe has associated specific countries with particular colour representation. Thus France has commonly been depicted by a blue hue, Britain by red or

pink, and Ireland by green. In addition, national atlases have often heightened the propaganda effect by using bold colours for their own country, as well as by centring the map projection there. The most significant examples of suggestive or persuasive maps are perhaps those produced by the National Socialists in their development of *Geopolitik* (Herb, 1989, pp.289-303), but less extreme practices of manipulative representation still abound in contemporary map production.

The conventional choice of colour representation would suggest green for the Celtic territories, red for Latin/Romance countries and blue for Germanic areas. However, in this case such conventions had to be overturned for technical reasons. Given that on the E.B.L.U.L. map the lesser-used languages which are derived from the same base language are to be represented in a variant shade of that base language (for example, Catalan from Latin, English from Low German), then the language grouping with the largest number of radiants determined the colour selection. Thus the Latin-based lesser-used languages numbered eighteen, the Germanic radiants seven and the Celtic only six. Therefore green was used for the Latin group, because it has the widest range of easily-distinguishable printed densities, while blue and red were employed for the Germanic and Celtic groups respectively.

Once such necessary production decisions have been made, we may turn to broader questions and ask what messages are being

conveyed by the resultant map. Is it suggesting that within the territories depicted the lesser-used language is dominant, or residual, or potential? Are the boundaries of the language territory to be depicted as current or historical, formal or informal? Do they denote official support and recognition for the language? To what extent do they mask the degree of functional bilingualism, by depicting only the lesser-used language, rather than all the significant languages, in any particular area?

The answer depends to a large extent upon the part of the map under consideration. In northern and western Europe the linguistic territories tend to incorporate both historical core areas and regions within which the lesser-used languages operate as recognised, legitimate mediums of communication. However, in parts of Mediterranean Europe, particularly Greece, the very existence of certain minority groups is a matter of current debate. Thus any attempt to designate the territory of Slav speakers as 'Bulgarian', 'Macedonian' or 'Slav-Macedonian' will be contentious and, in the absence of self-reported census information, largely dependent upon historical and social evidence. Are the Pomacs, for example, to be considered as a separate language group, or are they Bulgarian-speaking Muslims who differ from their fellow Greek Slavs only in religion? Equally contentious is the designation of Arvanite/Arberesch and Vlak areas, for although their distribution at the time of the War of Independence in 1821

was well-understood, their current distribution pattern is far less certain, and yet they need to be represented as a significant linguistic group by some symbol or means.

Data on such groups have not been collected systematically in the past, partly because of the paucity of the means of gathering state-wide information on social issues, and partly because past political expediency has deemed the recognition of such groups to be a strategically-sensitive matter. The current situation is that as a result of the Greek government's disquiet about the disclosure of such information, based as it is upon non-governmental sources, the publication of the map has been delayed subject to amendment. In the light of such difficulties, will purely technical improvements, such as better data-gathering techniques and computer-aided recording of information, be able to make any positive contribution to the future prospects of geolinguistic representation?

In the general area of geography and cartography there is already, of course, a considerable history of computer use. More specifically, in the field of geolinguistics, it is now over a decade since Orton first suggested that the *Survey of English Dialects* should be coded into machine-readable form, to expedite its progress, and as Figure 2(m) reminds us, computer-based linguistic maps are now with us, in their thousands. In some cases, official agencies, Census Canada in

particular, have adopted digital storage and processing of linguistic information, making the effective manipulation and scale transformation of mapped data an altogether more realistic prospect.

It would be far from the truth, however, to imply that computer-based geolinguistic mapping represents a universal success. Instead, it can be taken as an example of the broader resource problems which such technology brings to light. The capability of computer mapping of language information presupposes a data-collection process which is consistent, copious and accurate. That may be an unduly large assumption. A recently-published volume (Maguire, 1989), assessing the general role of computers in geographical study, considers the chronological sequence of key problems which have faced computer users. Initial problems of obtaining the computer hardware itself were supplanted by those of gaining access to suitable software, such as mapping programmes. As these became available, there arose a shortage of suitably-trained personnel, and finally, inevitably, there occurred an extreme proliferation of data (*op. cit.*, p. 4). It might be argued that the last-mentioned is scarcely a problem; such a proliferation was, in some respects, one of the very objectives of computer use. It only assumes the complexion of a problem if the accuracy and consistency of the information becomes difficult to maintain; and as explained earlier, that has been one of the traditional problems with linguistic data. The remedy, in

the longer term, calls for a large work-force, consistently-trained in matters of linguistic field observation and recording, together with levels of financial support which are, unfortunately, quite alien to the experience of most non-governmental geolinguists.

To set against that, the revolution in information technology makes possible (as it has in other fields of geography) the creation of continuously-augmented and updated linguistic data-banks, rather than the spasmodic "snap-shots" to which language geographers have become accustomed. Such frameworks for data storage and retrieval also provide the possibility of solving another of the problems mentioned earlier, in the context of the Welsh example in Figure 3. It was contended there that an understanding of the complex patterns of linguistic change, and perhaps also the formulation of an appropriate local policy response, demanded the acquisition of similarly-detailed, current information on a wide array of socio-economic indicators which were affecting the local language position. The possibilities raised by data banks for combining previously-unrelated information, while they would demand both caution and sophistication on the part of the user, open exciting prospects of more flexible local policy responses, together with new academic opportunities (for example, detailed studies of domain-related language-use).

Computer-aided linguistic mapping (in the broader sense of "mapping" implied by Figure 1) requires, in short, a parallel revolution in attitudes on the part of geolinguists. It has already been pointed out that language mapping is beset by problems of inconsistency in the way that data are stored, processed and presented. In the light of new opportunities to remedy such difficulties, it would be ironic if we, with our common interest in language and communication, allowed technology merely to amplify the level of Babel and further to hinder the passage of what Bottiglioni referred to as *"the word in the immediacy of its poetic creation"*.

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Acknowledgement: This is a revised version of J.E. Ambrose and C.H. Williams: 'Language Made Visible: Representation in Geolinguistics', in C.H. Williams (ed.): (1990) Linguistic Minorities, Society and Territory (Clevedon: Multilingual Matters, Chapter 11). It is reproduced with permission.